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(54) Title: COLOR STABLE LIQUID DISH CLEANING COMPOSITIONS CONTAINING A PEROXIDE SOURCE

(57) Abstract: A color stable liquid dish cleaning composition with desirable cleansing and destaining properties comprising a C8-18 ethoxylated alkyl ether sulfate, two anionic surfactants S, a betaine surfactant, hydrogen peroxide, a colorant, a hydroxy containing organic acid, polyethylene glycol.

COLOR STABLE LIQUID DISH CLEANING COMPOSITIONS CONTAINING A PEROXIDE SOURCE

Field of Invention

This invention relates to a color stable liquid dish cleaning composition which is designed to remove stains from surfaces, disinfect surfaces like dishes, countertops, sponges, while maintaining good foaming grease cutting, rinsing and mildness properties. The composition also exhibits excellent stability in terms of color and peroxide level.

Background of the Invention

The present invention relates to novel color stable light duty liquid detergent compositions with high foaming and good grease cutting properties as well as disinfecting properties.

The prior art is replete with light duty liquid detergent compositions containing nonionic surfactants in combination with anionic and/or betaine surfactants wherein the nonionic detergent is not the major active surfactant. In U.S. Patent No. 3,658,985 an anionic based shampoo contains a minor amount of a fatty acid alkanolamide. U.S. Patent No. 3,769,398 discloses a betaine-based shampoo containing minor amounts of nonionic surfactants. This patent states that the low foaming properties of nonionic detergents renders its use in shampoo compositions non-preferred. U.S. Patent No. 4,329,335 also discloses a shampoo containing a betaine surfactant as the major ingredient and minor amounts of a nonionic surfactant and of a fatty acid mono- or di-ethanolamide. U.S. Patent No. 4,259,204 discloses a shampoo comprising 0.8 to 20% by weight of an anionic phosphoric acid ester and one additional surfactant which may be either anionic, amphoteric, or nonionic. U.S. Patent No. 4,329,334 discloses an

anionic-amphoteric based shampoo containing a major amount of anionic surfactant and lesser amounts of a betaine and nonionic surfactants.

U.S. Patent No. 3,935,129 discloses a liquid cleaning composition containing an alkali metal silicate, urea, glycerin, triethanolamine, an anionic detergent and a nonionic detergent. The silicate content determines the amount of anionic and/or nonionic detergent in the liquid cleaning composition. However, the foaming properties of these detergent compositions are not discussed therein.

U.S. Patent No. 4,129,515 discloses a heavy duty liquid detergent for laundering fabrics comprising a mixture of substantially equal amounts of anionic and nonionic surfactants, alkanolamines and magnesium salts, and, optionally, zwitterionic surfactants as suds modifiers.

U.S. Patent No. 4,224,195 discloses an aqueous detergent composition for laundering socks or stockings comprising a specific group of nonionic detergents, namely, an ethylene oxide of a secondary alcohol, a specific group of anionic detergents, namely, a sulfuric ester salt of an ethylene oxide adduct of a secondary alcohol, and an amphoteric surfactant which may be a betaine, wherein either the anionic or nonionic surfactant may be the major ingredient.

The prior art also discloses detergent compositions containing all nonionic surfactants as shown in U.S. Patent Nos. 4,154,706 and 4,329,336 wherein the shampoo compositions contain a plurality of particular nonionic surfactants in order to affect desirable foaming and deterative properties despite the fact that nonionic surfactants are usually deficient in such properties.

U.S. Patent No. 4,013,787 discloses a piperazine based polymer in conditioning and shampoo compositions which may contain all nonionic surfactant or all anionic surfactant.

U.S. Patent No. 4,450,091 discloses high viscosity shampoo compositions containing a blend of an amphoteric betaine surfactant, a polyoxybutylenepolyoxyethylene nonionic detergent, an anionic surfactant, a fatty acid alkanolamide and a polyoxyalkylene glycol fatty ester. But, none of the exemplified

compositions contain an active ingredient mixture wherein the nonionic detergent is present in major proportion which is probably due to the low foaming properties of the polyoxybutylene polyoxyethylene nonionic detergent.

U.S. Patent No. 4,595,526 describes a composition comprising a nonionic surfactant, a betaine surfactant, an anionic surfactant and a C₁₂-C₁₄ fatty acid monoethanolamide foam stabilizer.

U.S. Patent 6,147,039 teaches an antibacterial hand cleaning composition having a low surfactant content.

Summary of the Invention

It has now been found that an antibacterial liquid dish cleaning composition can be formulated with three different anionic surfactants, a zwitterionic surfactant, polyethylene glycol, a hydroxy aliphatic acid, a peracetic acid and water which has desirable cleaning and foaming properties.

An object of this invention is to provide a liquid dish cleaning composition that can also be antibacterial, which comprises a sulfate surfactant, two sulfonate anionic surfactants, a zwitterionic surfactant, polyethylene glycol and a hydroxy aliphatic acid, wherein the composition does not contain any silicas, abrasives, acyl isoethionate, 2-hydroxy-4,2',4'-trichloridiphenyl ether, phosphoric acid, phosphonic acid, boric acid, alkali metal carbonates, alkaline earth metal carbonates, alkyl glycine surfactant, cyclic imidinium surfactant, or more than 3 wt. % of a fatty acid or salt thereof.

Another object of this invention is to provide a liquid dish cleaning composition with desirable stain removal, high foaming and cleaning properties which kills bacteria.

Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

Detailed Description of the Invention

This invention relates to a color stable liquid dish cleaning composition that can also be antibacterial, which comprises approximately by weight:

- (a) 10% to 14% of a sodium salt of a C₈-C₁₆ linear alkyl benzene sulfonate surfactant;
- (b) 10% to 14% of a magnesium salt of a C₈-C₁₆ linear alkyl benzene sulfonate surfactant;
- (c) 10% to 14% of an ammonium or sodium salt of an ethoxylated C₈-C₁₈ alkyl ether sulfate surfactant;
- (d) 0.1% to 5% of a zwitterionic surfactant;
- (e) 0.5% to 5%, more preferably 0.5% to 4% of a hydroxy containing organic acid and/or an alkali metal salt of a hydroxy containing organic acid which is selected from the group consisting of citric acid and salicylic acid and mixtures thereof;
- (f) 0.25% to 10%, more preferably 0.5% to 8% of a hydrogen peroxide;
- (g) 0.01% to 1.0%, more preferably 0.02% to 0.6% of a colorant;
- (h) 0.1% to 7% of polyethylene glycol; and
- (i) the balance being water, wherein the composition has a pH of 3 to 5 and has a viscosity of 100 to 1,000 cps, more preferably 200 to 600 cps at 25°C using a #21 spindle at 20 rpm as measured on a Brookfield RVTDV-II viscometer, wherein the composition does not contain lactic acid, any grease release agents such as choline, chloride or buffering system which is a nitrogenous buffer which is ammonium or alkaline earth carbonate, amine oxide surfactants, guanidine derivatives, alkoxyalkyl amines and alkyleneamines C₃-C₇ alkyl and alkenyl monobasic and dibasic acids such as C₄-C₇ aliphatic carboxylic diacids which do not contain a hydroxy group, boric acid, phosphoric acid, ethoxylated nonionic surfactants, amino alkylene phosphonic acid and alkyl polyglucoside surfactants and the composition is pourable and not a gel has a complex viscosity at 1 rad s⁻¹ of less than 0.4 Pascal seconds.

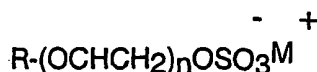
The anionic sulfonate surfactants which may be used in the detergent of this invention are selected from the consisting of water soluble and include the sodium,

potassium, ammonium, magnesium and ethanolammonium salts of linear C₈-C₁₆ alkyl benzene sulfonates; C₁₀-C₂₀ paraffin sulfonates, alpha olefin sulfonates containing about 10-24 carbon atoms and C₈-C₁₈ alkyl sulfates and mixtures thereof.

The paraffin sulfonates may be monosulfonates or di-sulfonates and usually are mixtures thereof, obtained by sulfonating paraffins of 10 to 20 carbon atoms. Preferred paraffin sulfonates are those of C₁₂-18 carbon atoms chains, and more preferably they are of C₁₄-17 chains. Paraffin sulfonates that have the sulfonate group(s) distributed along the paraffin chain are described in U.S. Patents 2,503,280; 2,507,088; 3,260,744; and 3,372,188; and also in German Patent 735,096. Such compounds may be made to specifications and desirably the content of paraffin sulfonates outside the C₁₄-17 range will be minor and will be minimized, as will be any contents of di- or poly-sulfonates.

Examples of suitable other sulfonated anionic detergents are the well known higher alkyl mononuclear aromatic sulfonates, such as the higher alkylbenzene sulfonates containing 9 to 18 or preferably 9 to 16 carbon atoms in the higher alkyl group in a straight or branched chain, or C₈-15 alkyl toluene sulfonates. A preferred alkylbenzene sulfonate is a linear alkylbenzene sulfonate having a higher content of 3-phenyl (or higher) isomers and a correspondingly lower content (well below 50%) of 2-phenyl (or lower) isomers, such as those sulfonates wherein the benzene ring is attached mostly at the 3 or higher (for example 4, 5, 6 or 7) position of the alkyl group and the content of the isomers in which the benzene ring is attached in the 2 or 1 position is correspondingly low. Preferred materials are set forth in U.S. Patent 3,320,174, especially those in which the alkyls are of 10 to 13 carbon atoms.

The C₈-18 ethoxylated alkyl ether sulfate surfactants have the structure



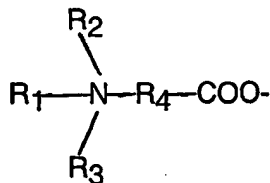
wherein n is about 1 to about 22 more preferably 1 to 3 and R is an alkyl group having about 8 to about 18 carbon atoms, more preferably 12 to 15 and natural cuts, for

example, C₁₂₋₁₄ or C₁₂₋₁₆ and M is an ammonium cation or a metal cation, most preferably sodium.

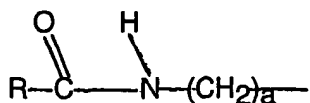
The ethoxylated alkyl ether sulfate may be made by sulfating the condensation product of ethylene oxide and C₈₋₁₀ alkanol, and neutralizing the resultant product. The ethoxylated alkyl ether sulfates differ from one another in the number of carbon atoms in the alcohols and in the number of moles of ethylene oxide reacted with one mole of such alcohol. Preferred ethoxylated alkyl ether polyethenoxy sulfates contain 12 to 15 carbon atoms in the alcohols and in the alkyl groups thereof, e.g., sodium myristyl (3 EO) sulfate.

Ethoxylated C₈₋₁₈ alkylphenyl ether sulfates containing from 2 to 6 moles of ethylene oxide in the molecule are also suitable for use in the invention compositions. These detergents can be prepared by reacting an alkyl phenol with 2 to 6 moles of ethylene oxide and sulfating and neutralizing the resultant ethoxylated alkylphenol. The concentration of the ethoxylated alkyl ether sulfate surfactant is about 1 to about 8 wt. %.

The water-soluble zwitterionic surfactant, which is an essential ingredient of present liquid detergent composition, provides good foaming properties and mildness to the present nonionic based liquid detergent. The zwitterionic surfactant is a water soluble betaine having the general formula:



wherein R₁ is an alkyl group having 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms, or the amido radical:



wherein R is an alkyl group having 9 to 19 carbon atoms and a is the integer 1 to 4; R₂ and R₃ are each alkyl groups having 1 to 3 carbons and preferably 1 carbon; R₄ is an

alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group. Typical alkyldimethyl betaines include decyl dimethyl betaine or 2-(N-decyl-N, N-dimethyl-ammonia) acetate, coco dimethyl betaine or 2-(N-coco N, N-dimethylammonio) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, lauryl diemethyl betaine, cetyl dimethyl betaine, stearyl dimethyl betaine, etc. The amidobetaines similarly include cocoamidoethylbetaine, cocoamidopropyl betaine and the like. A preferred betaine is coco (C₈-C₁₈) amidopropyl dimethyl betaine.

The hydroxy containing organic acid is preferably a hydroxy aliphatic acid selected from the group consisting of salicylic acid and citric acid and mixtures thereof.

Polyethylene glycol which is used in the instant composition has a molecular weight of 200 to 1,000, wherein the polyethylene glycol has the structure



wherein n is 4 to 52. The concentration of the polyethylene glycol in the instant composition is 0.1% to 7 wt. %, more preferably 0.1 wt. % to 5 wt. %.

The colorant which is a dye and/or pigment is selected from the group consisting of FD&C Yellow (CI15985), FD&C Red (40) (CI16035), Acid Violet 43 (CI60730), CI Pigment Blue (15.3) (Colonial Blue B26-130) (CI74160) and CI Pigment Green 7 (CI74260) and mixtures thereof.

The instant light duty liquid nonmicroemulsion compositions can contain about 0 wt. % to about 10 wt. %, more preferably about 1 wt. % to about 8 wt. %, of at least one solubilizing agent selected from the group consisting of a C₂-5 mono, dihydroxy or polyhydroxy alkanols such as ethanol, isopropanol, glycerol ethylene glycol, diethylene glycol, propylene glycol, and hexylene glycol and mixtures thereof and alkali metal cumene or xylene sulfonates such as sodium cumene sulfonate and sodium xylene sulfonate. The solubilizing agents are included in order to control low temperature cloud clear properties.

The instant formulas explicitly exclude alkali metal silicates and alkali metal builders such as alkali metal polyphosphates, alkali metal carbonates, alkali metal

phosphonates and alkali metal citrates because these materials, if used in the instant composition, would cause the composition to have a higher pH.

The final essential ingredient in the inventive compositions having improved interfacial tension properties is water. The proportion of water in the compositions generally is in the range of 10% to 95%.

The liquid cleaning composition of this invention may, if desired, also contain other components either to provide additional effect or to make the product more attractive to the consumer. The following are mentioned by way of example: Colors or dyes in amounts up to 0.5% by weight; bactericides in amounts up to 1% by weight; preservatives, UV absorbers, or antioxidizing agents, such as formalin, 5-bromo-5-nitrodioxan-1,3; 5-chloro-2-methyl-4-isothiazolin-3-one, 2,6-di-tert.butyl-p-cresol, etc., in amounts up to 2% by weight; pH adjusting agents, such as sulfuric acid or sodium hydroxide, as needed. Furthermore, if opaque compositions are desired, up to 4% by weight of an opacifier may be added.

In final form, the instant compositions exhibit color stability at reduced and increased temperatures. More specifically, such compositions remains stable in the range of 0°C to 50°C, especially 5°C to 43°C. Such compositions exhibit a pH of 3 to 5.

The following examples illustrate the liquid dish cleaning compositions of the described invention. Unless otherwise specified, all percentages are by weight. The exemplified compositions are illustrative only and do not limit the scope of the invention. Unless otherwise specified, the proportions in the examples and elsewhere in the specification are by weight.

Example 1

The following compositions in wt. % were prepared by simple mixing procedure:

	A	B	C	D
Magnesium linear C8-16 alkyl benzene sulfonate	12.915%	12.915%	12.915%	12.915%
Sodium linear C8-16 alkyl benzene sulfonate	12.915%	12.915%	12.915%	12.915%
Ethoxylated C8-C18 alkyl ether sulfate 1.3 EO	12.67%	12.67%	12.67%	12.67%
Cocoamide propyl dimethyl betaine	0.5%	0.5%	0.5%	0.5%
Lactic acid	1.4%	0.0%	0.0%	0.0%
Citric acid	0.0%	1.0%	0.5%	0.0%
Sodium Citrate	0.0%	0.0%	0.5%	0.0%
Salicylic acid	0.0%	0.0%	0.0%	1.0%
Hydrogen Peroxide	2.0%	2.0%	2.0%	2.0%
Polyethylene glycol 300	4%	4%	4%	4%
Fragrance	0.40%	0.40%	0.40%	0.40%
Tinogard TL	0.03%	0.03%	0.03%	0.03%
Water	Balance	Balance	Balance	Balance
pH	3.5-4.0	3.5-4.0	3.5-4.0	3.5-4.0
% peroxide, Initial	2.0%	2.0%	2.0%	2.0%
% peroxide, after 2w, 135F	1.5%	1.8%	1.8%	1.7%
% peroxide, after 4 cycles in the Atlas Weatherometer i.e. (8 Weeks)	1.74%	1.89%	1.91	N/A

Atlas Weather-o-meter: a weather-o-meter instrument (supplier Atlas, model Ci35A) providing an irradiance of 0.35 W/m² at 340 nm was utilized. The instrument uses a Xenon arc lamp that produces a stable power distribution which, when unfiltered, closely matches sunlight in outer space. With the proper filters, 1 borosilicate and 1 soda lime, the distribution closely matches sunlight through a window. According to the supplier 6.6 hours exposure from the Xe lamp corresponds to 1 day of sun in Miami, Florida. The products were placed in the Xe chamber a total of 32.8 kJ/m². (Note, this chamber irradiates 1.24 kJ/m² of energy every hour.)

Table:

Time Exposure (hours)	Total Energy per Unit Area (kJ/m ²)	Equivalent Days in Miami Sun (days)
6.6	8.2	1
13.2	16.4	2
26.4	32.8	4

Example 2

The following compositions in wt. % were prepared by simple mixing procedure:

	A	B	C	D
Magnesium linear C8-16 alkyl benzene sulfonate	12.915%	12.915%	12.915%	12.915%
Sodium linear C8-16 alkyl benzene sulfonate	12.915%	12.915%	12.915%	12.915%
Ethoxylated C8-C18 alkyl ether sulfate 1.3 EO	12.67%	12.67%	12.67%	12.67%
Cocoamide propyl dimethyl betaine	0.5%	0.5%	0.5%	0.5%
Lactic acid	1.4%	0.0%	0.0%	0.0%
Citric acid	0.0%	1.0%	0.5%	0.0%
Sodium Citrate	0.0%	0.0%	0.5%	0.0%
Salicylic acid	0.0%	0.0%	0.0%	1.0%
Hydrogen Peroxide	2.0%	2.0%	2.0%	2.0%
Polyethylene glycol 300	4%	4%	4%	4%
Orange color solution	0.14%	0.14%	0.14%	0.14%
Fragrance	0.40%	0.40%	0.40%	0.40%
Tinogard TL	0.03%	0.03%	0.03%	0.03%
Water	Balance	Balance	Balance	Balance
pH	3.2-4.2	3.2-4.2	3.2-4.2	3.2-4.2
Color, Initial (visual)	Orange	Orange	Orange	Orange
Color after 2w, 135F	yellow	orange	orange	orange
Color after 4 cycles in the Atlas Weatherometer	yellow	orange	orange	orange

- A. orange color solution:

FD&C Yellow No 6 (CI 15985)	1.7 %
FD&C Red No.40 (CI 16035)	0.3%
Water	98%

Example 3

Pigments or combinations of pigments/dyes can also be considered at the following level in the formula.

The following compositions in wt. % were prepared by simple mixing procedure:

	A	B	C	D
Magnesium linear C8-16 alkyl benzene sulfonate	12.915%	12.915%	12.915%	12.915%
Sodium linear C8-16 alkyl benzene sulfonate	12.915%	12.915%	12.915%	12.915%
Ethoxylated C8-C18 alkyl ether sulfate 1.3 EO	12.67%	12.67%	12.67%	12.67%
Cocoamide propyl dimethyl betaine	0.5%	0.5%	0.5%	0.5%
Lactic acid	1.4%	0.0%	1.4%	0.0%
Citric acid	0.0%	1.0%	0.0%	1.0%
External D& C violet No. 2	0.00065%	0.00065%		
CI Pigment Blue 15:3 (Colanyl Blue B2G-130)	0.000125 %	0.000125 %		
CI Pigment Blue 15:3 (CI 74160)			0.000056 %	0.000056 %
CI Pigment Green 7 (CI 74260)			0.000750 %	0.000750 %
Hydrogen Peroxide	2.0%	2.0%	2.0%	2.0%
Polyethylene glycol 300	4%	4%	4%	4%
Orange color solution	0.14%	0.14%	0.14%	0.14%
Fragrance	0.40%	0.40%	0.40%	0.40%
Tinogard TL	0.03%	0.03%	0.03%	0.03%
Water	Balance	Balance	Balance	Balance
pH	3.2-4.2	3.2-4.2	3.2-4.2	3.2-4.2
Color, Initial (visual)	Blue	Blue	green	green
Color after 1w, 135F	Faded blue	Blue	Slightly faded green	green
Color after 2 cycles in the Atlas Weatherometer	Green (blue color gone)	Slightly faded blue	Slightly faded green	green

All above pigments are from Clariant.

What Is Claimed:

1. A color stable liquid dish cleaning composition with de-staining and disinfectant properties with improved peroxide and color stability, which comprises approximately by weight:
 - (a) 10% to 14% of a sodium salt of a C₈-C₁₆ linear alkyl benzene sulfonate surfactant;
 - (b) 10% to 14% of a magnesium salt of a C₈-C₁₆ linear alkyl benzene sulfonate surfactant;
 - (c) 10% to 14% of an ammonium or sodium salt of an ethoxylated C₈-C₁₈ alkyl ether sulfate surfactant;
 - (d) 0.1% to 5% of a zwitterionic surfactant;
 - (e) 0.5% to 5%, more preferably 0.5% to 4% of alpha hydroxy containing organic acid and/or an alkali metal salt of said alpha hydroxy organic acid;
 - (f) 0.5% to 10% of a hydrogen peroxide;
 - (g) 0.01% to 1% of a colorant;
 - (h) 0.1% to 7% of polyethylene glycol; and
 - (i) the balance being water, wherein the composition has a pH of 3 to 4 and has a viscosity of 100 to 1,000 cps at 25°C using a #21 spindle at 20 rpm as measured on a Brookfield RVTDV-II viscometer.
2. The composition of Claim 2, wherein the hydroxy containing organic acid is selected from the group consisting of acid, citric acid and salicylic acid and mixtures thereof.
3. The composition of Claim 1, wherein said colorant is selected from the group consisting of CI Pigment Green 7, CI Pigment Blue 15.3, FD&C Yellow 6, FD&C Red 40 and Acid Violet 43 and mixtures thereof.

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B. FIELDS SEARCHED

IPC 7 C11D

EPO-Internal, WPI Data, PAJ

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A US 6 147 039 A (JACQUES ANNE ET AL)
14 November 2000 (2000-11-14)
cited in the application
column 7, line 6 - line 35; claims;
examples

A US 6 326 347 B1 (GAMBOGI ET AL)
4 December 2001 (2001-12-04)
column 6, line 6 -column 9, line 34;
claims 1,4

A US 4 224 195 A (KAWASAKI YOSHIMI ET AL)
23 September 1980 (1980-09-23)
cited in the application
claims

1-3

1-3

1

-/-

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Fax (+31-70) 340-3016

Authorized officer

Serbetsoglou, A

INTERNATIONAL SEARCH REPORT

Internat Application No

PCT/US 03/06763

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 27990 A (PROCTER & GAMBLE) 18 May 2000 (2000-05-18) claims ---	1-3
A	US 6 306 817 B1 (KOTT ET AL) 23 October 2001 (2001-10-23) claims; example 13 ---	1
P,A	US 6 444 636 B1 (TOUSSAINT CHRISTINE ET AL) 3 September 2002 (2002-09-03) claims; example 1 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

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